tion by Dr. Albert H. Smith, with Paquelin's thermo-cautery knife, in which he encountered the placenta in the line of incision. The operation by Dr. Atlee, as far as I have been able to ascertain, is the first one of its kind that has been performed in Philadelphia. The dead fœtus has been removed after the pointing of an abscess, but in no instance before suppuration had commenced, as in his case. The fatal cases reported within a few years that it is now thought might have been saved by opening the abdomen promptly, will no doubt bear fruit in the future in the form of a more decided disposition to operate, and a greater hopefulness in the result to the women. The successes of Drs. Thomas, Jessop, and Atlee should certainly encourage others to follow their example.

713 LOCUST STREET, July 30, 1878.

ARTICLE II.

ON THE RELATIONS BETWEEN PROGRESSIVE ATAXY AND SPASMODIC SPINAL PARALYSIS.

By JULIUS ALTHAUS, M.D., M.R.C.P. Lond., Senior Physician to the Hospital for Epilepsy and Paralysis, Regent's Park, London.

RECENT microscopic investigations of the anatomical changes in these two diseases have shown that the lesion does not originally affect the entire extent of the several columns of the spinal cord, but only a certain portion thereof. In progressive locomotor ataxy the morbid process begins in that part of the posterior columns which Henle has termed the "Keilstrang," funiculus caudatus, and which the French anatomists call the "rubans" or "bandelettes externes;" that is to say, the external portion of the posterior column, which is in close proximity to the posterior roots of the spinal nerves; while the internal portion of the same, which Burdach has called the funiculus gracilis, but which is now generally known as Goll's column, is not primarily affected, but only suffers later on, when the disease spreads to the other portions of the nervous matter, such as the posterior roots, the posterior cornua of the gray matter, etc. On the other hand, in spasmodic spinal paralysis, spasmodic tabes dorsalis, or lateral sclerosis of the spinal cord (Erb, Charcot), the lesion attacks first the posterior portion of the lateral columns, which Flechsig has termed the crossed pyramidal column, and which is composed of fibres derived from the opposite cerebral hemisphere. This is distinct from the lateral column proper, which is situated more anteriorly, and the direct cerebellar column, which lies more to the rear. The pyramidal column is in this disease found studded with wedge-shaped gray patches, reaching anteriorly as far as the lateral column proper, exteriorly as far as the pia mater, and interiorly as far as the posterior cornua. This peculiarity in the localization of the disease distinguishes it anatomically (*a*) from

Türck's degeneration, or secondary lateral sclerosis consequent on cerebral hemorrhage, in which the patches are rounded, not wedge-shaped, and do not spread exteriorly as far as the pia mater; and (*b*) from secondary sclerosis after myelitis, hemorrhage into the cord, etc., where the gray patches do not extend posteriorly as far as the posterior cornua, but where a small intermediate layer of healthy white matter remains between them and the sclerosed tissue.

In analyzing the various symptoms which we meet with in posterior and lateral sclerosis, we find that the most important in the former are referable to sensory disturbance and want of motor coördination; while true paralysis, with muscular spasms and rigidity, may be considered characteristic of the latter. I will now endeavour to trace these symptoms to morbid alteration of the normal functions of the affected parts, such as they are known to us from the present teaching of experimental physiology.

That sensibility in its various forms should suffer in disease of the posterior columns, is only what might be expected, inasmuch as these parts have been experimentally shown to contain the chief paths for the conduction of the senses of touch, pressure, temperature, and tickling. In accordance with this we find such symptoms as the following: a feeling of constriction round the chest, abdomen and limbs; numbness and tingling in the legs and feet; a sensation in walking as if the patient stepped on bladders or cotton; tardy sensation, so that several seconds are required for appreciating an impression which has been made; loss of the keenness of touch, so that the patient is unable to tell the nature of an object which is given him to touch, without the help of his eyes; diminution or loss of the muscular sense, so that, without looking, the patient is not aware of the position of his limbs, or of any changes which are made in it by others. All these signs, and in the later stages of the disease, cutaneous anæsthesia, are amongst the commonest symptoms of ataxy, and absent only in the most exceptional cases.

A prominent symptom of tabes dorsalis is a peculiar kind of pain which darts through the limbs like lightning, occurs chiefly at night, selects mostly the lower extremities, but spares no part of the body, is sometimes neuralgic in character, so that there is a paroxysm and afterwards an interval of rest, while at other times it is more continuous, and lasts in various degrees of intensity for weeks and months. Now it has been shown that the paths for the conduction of the sensation of pain are not situated in the posterior columns, but in the central gray matter; and as the pain to which I have just alluded, is one of the most constant earlier symptoms of posterior sclerosis, and occurs at a period when the central gray matter is still unaffected, it must be referred to irritation of the posterior roots in Henle's "Keilstrang," where the disease is located in the first instance.

A far greater difficulty is experienced in physiologically explaining the symptom of ataxy, or want of coördination, which is not only locomotor, as usually stated, *i. e.*, perceptible in complex movements, but also *static*; that is to say, that there is a difficulty or impossibility of keeping the arms and legs, the body, and in some cases even certain muscles supplied by the cranial nerves, for any time fixed in certain positions. The atactic patient has indeed not only great difficulty in walking, but cannot stand erect with the feet close together. Where the disease affects the cervical cord, he finds it impossible to write, dress, play musical instruments, etc., and cannot well keep his arm or hand stretched out in a certain direction. This symptom of locomotor and static ataxy is a true motor phenomenon, and not dependent upon anæsthesia, as was formerly believed. That such is the case, is shown by the fact that the degree of ataxy is not at all proportionate to the degree of anæsthesia which may be present, inasmuch as the one is occasionally found slight, and the other severe, and *vice versâ*. Moreover, complete anæsthesia of the limbs may exist without simultaneous ataxy, which alone renders it evident that this latter is nothing but a symptom of disordered motion.

As both locomotor and static ataxy occur with great regularity in diseases of the posterior columns, we would naturally draw the inference that these structures are the centres for the coördination of complex movements; yet Goltz's experiments have shown unmistakably that no such centres exist, either in the posterior columns, or anywhere throughout the entire extent of the cord; on the contrary, they are situated in the brain, residing more particularly in the corpora quadrigemina, the optic thalamus, and the cerebellum. If therefore the posterior columns are not actual centres, we might at least expect them to contain the paths by which the coördinating impulses travel from the brain to the muscles. But even this supposition is controverted by Woroschiloff's experiments, which tend to show that, at least in the rabbit, these paths are situated in the middle third of the lateral columns of the cord, and do not touch the posterior columns at all. Physiology and pathology seem therefore in such a simple case as this for the present hopelessly at variance with each other; and we must leave to future observations the task of reconciling these apparently discrepant phenomena.

Experimental destruction of the posterior columns in animals does in no way impair the voluntary motion of the parts behind the lesion; and in accordance with this we find that in the first two stages of sclerosis of these columns there is no loss of voluntary power over the muscles, or paralysis. The patient may be unable to walk or to use his limbs for any useful purpose, but is still in possession of motor power, so that when he is sitting or lying down, he can move his legs, cross one over the other, etc., and it is only in the later stages of the disease, when the sclerosis creeps up to other portions of the spinal centre, that true paralysis may be observed.

The functions of the lateral columns of the cord are still to a great extent enveloped in obscurity. There is diversity of opinion amongst physiologists with regard to their being concerned in the conduction of sensations; but it appears highly probable that each lateral column contains sentient fibres for both extremities, and that these fibres cross over from one to the other side of the organ. Pathological observation does not quite tally with these data, for in a number of cases of lateral sclerosis symptoms in the sphere of sensibility are entirely wanting, while in some we find pain, tingling, numbness, a feeling of heat and cold in the skin, etc.; but even in these latter cases the sensory disturbance only occurs in the commencement of the disease, and is very moderate in degree. On the other hand, the lateral columns are generally acknowledged to contain the principal paths for the voluntary movements for the extremities, for which, however, they are associated throughout with the large ganglionic masses of the gray anterior cornua, and the anterior roots of the spinal nerves. In accordance with this we find that in lateral sclerosis loss of motive power in the extremities, constitutes one of the principal symptoms.

This loss of power is at first very slight. The patient feels weak in the legs, and has a difficulty in going up and down stairs; after walking a short distance he is greatly fatigued. There is great difficulty in lifting the feet from the ground; they are apt to shuffle along it, and the soles of the boots, by scraping the ground, are sooner worn out at the toes than formerly. The patient soon takes to sticks or crutches. Coincident with the loss of power there is motor irritation, as shown by twitches, cramps and convulsions, which are apt to occur after fatigue, but often come on without any apparent exciting cause, and with considerable regularity, nay, periodicity, at certain hours of the day. After a time, the muscles assume a degree of rigidity, which in its turn renders voluntary movements more difficult, and causes resistance to passive movements. The patient finds it difficult to stoop. The legs resist flexion, extension and abduction, and the foot assumes the position of varo-equinus. This state of things induced Seguin to describe the complaint as "tetanoid paraplegia."

In consequence of these differences in the pathological condition of the lower extremities, the gait of the patient affected with ataxy forms a complete contrast to that which is seen in one suffering from lateral sclerosis. The ataxic patient uses his eyes as crutches, and is constantly looking at his feet in order to guide their movements. He walks in a jerky and irregular manner, puts his feet down with force, throws the toes heavily forwards and outwards, staggers in turning round, and has to manœuvre considerably with his arms in order to prevent himself from falling. On closing the eyes, or in the dark, he is particularly unsteady, and liable to fall. The patient with lateral sclerosis, on the other hand, seems to be, as it were, fixed in a vice. While he has no difficulty in standing, the legs appear so stiff that he is almost unable to get the feet from the ground ; he walks on tiptoe ; the whole body seems to join in a spasmodic effort, and is thrown forward, in order to aid the action of the legs. There is tendency to fall forwards ; yet the help of the eyes is not sought in walking, and light or dark makes no difference in it.

The faculty of reflex action has been shown to reside in the ganglionic cells of the central gray matter of the cord, where sentient impressions are conveyed from the posterior roots of the spinal nerves to motor paths in the anterior roots. Destruction of the gray matter annihilates reflex action. Thus we find that in anterior polio-myelitis, where the anterior cornua are disorganized by inflammation, no reflex movements can be elicited, although tickling of the soles is distinctly perceived, and sensibility altogether normal. Neither the posterior nor the lateral columns contain any centres for this faculty, and coincidently with this we find that in posterior as well as lateral sclerosis the reflex function of the skin and mucous membranes is in a general way preserved. A singular and important feature of the two diseases which we are now considering is, however, the behaviour of *tendinous reflexion*, which appears to present a marked contrast in them. Westphal and Erb have shown that reflex movements may be elicited, independently of cutaneous stimulation, by giving a tap or blow with the fingers or a hammer on certain tendons, such as that of the rectus femoris, the tendon Achillis, and that of the triceps muscle of the arm. Such a tap or blow is generally answered by a contraction in the muscle or set of muscles connected with the tendon, and is not owing to mechanical concussion of the muscular substance, as Westphal at first believed, but to true reflex action, the centre of which for the legs appears to be situated in the lower portion of the spinal cord (Schultze and Fürbringer). It is best shown by a patient being made to sit on a table, so that the legs dangle about; the tendon of the rectus is now gently struck, when the foot is seen to be jerked forward. That it is stimulation of the nerves of the tendon, and not of the skin, which produces this phenomenon, is shown by the circumstance that it occurs after the skin has been rendered insensible by the ether-spray, and that it may be present where cutaneous reflexion is diminished or gone, and *vice versa*.

Now tendinous reflexion appears to be entirely gone in ataxy as soon as this disease has become fairly developed; while it is, on the contrary, greatly increased in lateral sclerosis. Thus, when a patient suffering from this latter complaint is told to stamp on the floor with his foot, the whole limb is thrown into a state of tremor, which may continue for hours. This tremor may also be excited by suddenly flexing the foot, and can be generally arrested by extending the same. It thus comes to resemble the phenomenon known by the incongruous name of "spinal epilepsy." Such reflex movements are in lateral sclerosis not only more readily induced in those tendons in which they habitually appear in healthy subjects, but they also occur in other tendons in which they are usually absent, such as those of the tibiales and semitendinosus muscles of the lower, and the biceps, deltoid, supinator, and extensor digitorum communis muscles in the upper extremity. In doubtful cases the opposite behaviour of tendinous reflexion in posterior and lateral sclerosis may therefore be utilized for the purpose of diagnosis. The increase of the phenomenon in lateral sclerosis cannot be explained by irritation of the gray matter, as this does not share in the affection, but has to be accounted for by the influence of inhibition. The centre for the inhibition of reflex movements is situated in the corpora quadrigemina, and paths for its conduction are found in the lateral columns. We shall therefore be justified in assuming that the increase of tendinous reflexion in lateral sclerosis is owing to the cessation of arrival of inhibitory influence from the brain in the muscles, from interrupted connection.

Symptoms on the part of the vaso-motor nerves and of those which preside over nutrition, are rare in lateral as well as posterior sclerosis, unless the lesion has invaded other portions of the cord. An exception to this rule is however found in some forms of ataxy, where a peculiar affection of the joints, more particularly of the knee, shoulder, elbow, and hip is apt to occur. The joints, as well as the subcutaneous cellular tissue in their neighbourhood, become subject to a non-inflammatory swelling, which is unattended by pain, tenderness, redness, or heat. This lesion is nevertheless of a serious nature, as it leads to atrophy of the epiphyses, dislocation, and consequent deformity and uselessness of the limbs. Excessive fragility of the bones may also be present. These symptoms can only be owing to more or less sudden failure of nutrition in the parts affected; but it has not yet been ascertained which portion of the cord is to be held responsible for this condition.

The principal centre for the movements of the bladder, rectum, and male organs of generation, has by physiologists been found in the lumbar enlargement of the cord; but the more precise seat of this centre has not yet been ascertained. Judging from pathological observations, I should say that it is not situated in the lateral columns, for in lateral sclerosis there are no symptoms pointing to loss of function in these viscera. It is true that Dr. Gray, of Long Island College, has quite recently recorded a case in which there was involuntary action of the bladder if the desire to urinate was not quickly gratified; but this is most exceptional, and most likely owing to extension of the disease to other parts. In posterior sclerosis, on the other hand, either irritation or failure in the action of the bladder, bowel, and sexual organs, is the rule, and appears at a comparatively early stage of the disease. Total loss of function in these parts is only observed in the later period, when the posterior cornua of the gray matter have permanently become sclerosed. Even where the patient is unable to walk, the sexual function may still be in existence, as shown by the following case which is now under my care at the Hospital for Epilepsy and Paralysis, Regent's Park:—

J. R., aged 40, single, a commercial traveller, was admitted under the care of Dr. Althaus on January 25th, 1878. He has travelled much in the tropics, undergone great exposure to cold and heat, and lived a wild life, exceeding in sexual relations as well as in drinking. Five years ago he had an attack of delirium tremens. He also has had a soft chancre and gonorrhœa, which resulted in stricture of the urethra, but never had constitutional syphilis. Two years ago, when in South America, he first felt difficulty in walking, and was some time afterwards admitted into the Hospital of Buenos Ayres, where he remained three months. He noticed that he walked much worse in the dark than in the daytime, and that he had constantly to look at his feet for guiding the movements of the legs. He got better and worse alternately, but two months ago he was still able to walk about, and could at a stretch go on for three miles. One day, however, when about to cross a street, he had to jump in order to avoid being run over by a cab. This seemed to give him a strain in the back, and from that time forward he has gone down steadily.

Present state: The brain is quite free from disease, but the third left cranial nerve is affected, there being paralysis of the left rectus internus and the inferior oblique muscles. In consequence of this the patient is unable to turn the left eye inwards and upwards. There is crossed diplopia and divergent strabismus. There also appears at first sight to be ptosis of the left upper eyelid, but on closer examination it is found that the levator palpebræ superioris muscle is not paralyzed, but is intentionally put out of action by the patient in order to avoid the annoyance of double images; for the eye, although habitually closed, can be opened at request without any difficulty. The ocular muscles of the right eye and all the other cranial nerves are quite healthy.

The cord-affection in this case is at present confined to the lumbar enlargement. The arms and hands are in their normal state, and there is no disease of the thoracic and abdominal viscera. Incomplete anæsthesia commences in the hypogastric region, and spreads from there to the lower extremities, being particularly marked in the feet and legs, and less so in the thighs and hips. He feels the ground quite soft, like cotton or velvet; is still able to feel the prick of a pin, but has a sensation of great numbness in the legs. The power of walking is entirely gone, and the patient can only stand when supported on both sides, yet he is well able to cross one leg over the other when sitting, and has no difficulty in moving the legs in the recumbent position. The nutrition of the muscles of the lower extremities has suffered a good deal, but evidently more from disuse than from disease of the anterior cornua, for they respond well to the faradaic and galvanic current. Cutaneous reflex excitability is preserved, but tendinous reflexion absent. The bladder is weaker than formerly, but there is only occasionally retention. The bowels are regular. Sexual desire is absent, and the power diminished, but not gone, for the patient is occasionally subject to nocturnal emissions of semen, and has erections on first waking in the morning.

On the other hand, I have found that in inflammation of the anterior cornua of the lumbar enlargement, with consecutive muscular atrophy, the bladder and rectum continue to act normally, while the male sexual function is at once and completely destroyed. It therefore appears to me probable that the posterior columns are not the centre, but contain only the paths for the conduction of motor impulses to the bladder, rectum, and sexual organs; that the true centre for these parts is situated in the central gray matter; that the posterior cornua of this substance are the centre for the bladder and rectum; and that the anterior cornua contain an important centre for the male sexual organs.

The mode of development of both lateral and posterior sclerosis is, as a rule, extremely chronic and protracted over years, nay, decennia. In both, the morbid process usually commences in the lumbar enlargement of the cord, owing to which the symptoms appear simultaneously and to an equal, or nearly equal, extent in both lower extremities. The disease has a tendency to remain limited to this neighbourhood for years, but to spread within it from one set of nerve-cells and fibres to another, so as to gradually disorganize the whole structure. There is, however, no continuous progress of this sort, but it goes on, as it were, by fits and starts; for a time, the morbid process appears arrested, after which, mostly owing to unfavourable external influences, a fresh start in the wrong direction is made, which stops again at a certain point. The course of the complaint is particularly slow where the patients are placed in favourable conditions, and are not obliged to expose themselves to cold and wet, or to undergo exertions and privations; and where, in addition to this, they resign themselves to a quiet and uneventful life. In the contrary circumstances, the development of the disease is far more rapid.

After a variable time, the sclerosis spreads upwards through the dorsal portion of the cord to the cervical enlargement, where it assumes the same course of slow disintegration. Even then, however, neither lateral nor posterior sclerosis has the tendency to shorten life, unless the morbid process spreads more transversely through the organ, when cystitis, bedsores, and blood-poisoning are apt to become developed; or where it creeps up to the medulla oblongata and its motor nuclei, when death takes place from failure in the power of the cardiac and respiratory centres, or through inanition, from loss of the power of swallowing. In other cases, the patient succumbs ultimately to certain complications, such as typhoid fever, pulmonary consumption, bronchitis, pneumonia, affections of the heart and liver, and other diseases which have no particular connection with the sclerosis.

There are, however, some peculiarities in the course of both affections to which a short allusion must be made. The participation of the cranial nerves in the first stage of posterior sclerosis is one of them; and we are therefore led to think that ataxy has, even in the beginning, more tendency to generalization than lateral tabes. In the latter, it is not uncommon that the clinical aspect of the case is at first more like that of hemiplegia than paraplegia, the affection beginning in one leg and then creeping up to the arm of the same side; or it assumes the form of cervical paraplegia, beginning in both upper extremities and gradually descending to the lower ones. Anomalies of this description also occur now and then in posterior sclerosis.

In cases where spasmodic spinal paralysis assumes the form of hemiplegia, the clinical features of the case resemble very closely those of cases of cerebral hemorrhage, with consecutive sclerosis of the crossed pyramidal column of the cord, of which the following is an instance:—

C. B., a fish-salesman, aged 40, married, admitted under the care of Dr. Althaus on February 14th, 1878. Seven years ago, while attending to his business, he had an attack in which he to some extent lost his speech and the use of his left side. He could speak, but thickly and with an effort, and could walk a little, but kept falling down as he went on. He was admitted into the London Hospital, Whitechapel, but was not able to resume his business when he left it. Twelve months after the first attack he had another, which was more severe than the first, and took the speech and use of the left side away more completely than the first. Consciousness was also lost for some time. He attributed his illness to anxiety and excitement in business, and had had very heavy losses just previous to the first attack. His parents were nervous people and had died early; and he had for some time previous to the first attack suffered from headache and indigestion.

On examination, it was found that the speech was somewhat thick and indistinct, but quite fluent. There was no loss of words. The patient's manner is peculiar, somewhat silly; his memory is not good. The cranial nerves are quite healthy; there is loss of power in the left side, combined with muscular rigidity. The arm is abducted from the body, and the elbow, wrist, and fingers are in a state of extension. There is great difficulty in flexing and supinating the arm, and in bending the hand and fingers, and considerable resistance to passive movements in that direction. The gait of the patient is most characteristic and indicative of lateral sclerosis; he walks on tiptoe with the left leg, which seems to be fixed in a vice, so awkward and slow are its movements. The foot is inclined to scrape the ground as it shuffles along, and there is tendency to fall forward on that side. The rigidity is marked in the rectus femoris, and there is difficulty in flexing the leg and foot. The reflex action of the skin and of the tendons is increased, more especially in those of the triceps of the arm and the rectus. There is slight wasting of the muscles, but not more than could be attributed to disuse; and the faradaic and galvanic response is slightly less than on the healthy side. Sensation is not affected, and the chest and abdominal organs are healthy.

It is evident that in this case there was at first hemorrhage from one or several miliary aneurisms in the arterioles springing from the Sylvian artery and supplying the right corpus striatum, thus causing left hemiplegia. There was never any real aphasia, but only such affection of speech as is met with apart from disease in Broca's convolution. In consequence of the effusion of blood, secondary sclerosis (as first described by Türck, of Vienna) set in in the posterior portion of the lateral column, which is composed of fibres derived from the opposite cerebral hemisphere; and, as the same portion of the cord is also affected in spasmodic spinal paralysis, the physiological similarity in the symptoms is easily understood. The cause and history of the two maladies are, however, quite different, the one being primary, the other secondary sclerosis. Anatomically, they differ likewise, inasmuch as the gray patches in secondary sclerosis are rounded, while in the primary form they are wedge-shaped; likewise, in primary sclerosis, these patches spread exteriorly as far as the pia mater, while in the secondary form they stop short at some distance from that membrane.

The chief cause of lateral tabes appears to be cold. Sleeping in a damp bed, getting a thorough wetting during a day's shooting, etc., is generally mentioned by the patients. Whether hereditary tendency, lead-poisoning, sexual excesses, and syphilis, play any part in the causation of the diseases, remains uncertain. The patients I have seen were all males, between 35 and 50 years of age; yet it occurs in women likewise, and also later and earlier than the period just mentioned.

The causes of posterior sclerosis are much better known. Some forms of it are clearly hereditary; but more frequently the neurotic constitution is not marked in the parents of the patients. Cold, sexual excesses, over-exertion, and depressing mental emotions are the most frequent amongst them; and the disease is particularly developed where all these different agents act together. Accidents, more especially a fall from horseback, are often mentioned in the history of these cases; yet ataxy is rarely seen after railway accidents, and in those cases where injury was mentioned to me as a cause, the interval between its occurrence and the outbreak of the malady was so long that it appeared difficult to assume a causal connection betwixt the two.

The *prognosis* in both lateral and posterior sclerosis is, in a general way, unfavourable, as soon as the symptoms have become fully developed, yet every physician who has seen much of these diseases knows of some cases in which complete, or almost complete recovery has taken place. Mostly, however, we must be satisfied if we succeed in arresting the progress and relieving the symptoms of the complaint. The prognosis depends greatly upon external circumstances and the mode of life adopted by the patient. Those who have to work for their living are worse off in this respect than those born with the silver spoon in their mouths; and the rake dies more quickly than the philosopher. Two of the most marked cases of ataxy which I ever saw, occurred, one in a member of the hereditary branch of the British Legislature, who, being of slight physique and calm and fastidious by temperament, surrounded himself with everything that may adorn life, and found consolation for his infirmity in the arts and literature. He lived to the age of sixty, after having been subject to the complaint for upwards of thirty years, and having hardly ever experienced really severe suffering. The other case was that of a hot-tempered Irishman, who, after having made a fortune in Australia, returned to England to spend his life in the wildest excitement, intrigues, and debauchery of every description. He died within four years from the outbreak of the malady, after having undergone the most frightful tortures which man may be called upon to endure, and after having seen an originally herculean constitution undermined and wasted in a comparatively short time.

The treatment of both diseases must be persevered in systematically for a considerable time if any real success is to be achieved. Rest is of great importance, and we must endeavour to arrange all conditions of life as favourably as possible for the patients. Of specifics we have two, viz., nitrate of silver and ergot of rye. Some great cures have been effected by the use of either of these medicines, more particularly in the earlier stages of the complaint; but, in the majority of cases, and at a later period, their effect is disappointing. Nitrate of silver should be given in doses of from $\frac{1}{8}$ to $\frac{1}{2}$ grain, and must be stopped after 120 grains have been given. The urine should be tested frequently and the remedy omitted if albuminuria be induced by it. Ergot is given either as Bonjean's ergotine, in doses from 1 to 5 grains, or as the liquid extract, in doses from 20 to 120 minims. I have completely cured two cases of ataxy with drachm doses of the latter preparation, three times a day; and at no period during its administration, which in one instance extended to six, and in another to eight months, were there any symptoms of ergotism. Damiana likewise appears to have a special influence on the cord in these cases; I give it in doses of 20 to 60 minims of the liquid extract. Iodide of potassium, strychnia, and arsenic are generally ineffective. The constant galvanic current is useful for the relief of pain, paralysis of the ocular muscles, anæsthesia, and vesical debility. If used sufficiently early, it appears capable of arresting the disease. It is, however, essential for success that a gentle and perfectly steady current should be used, by large electrodes, for a short time, and that all shocks, Voltaic alternatives, or powerful and prolonged applications be avoided. A judiciously directed hydrotherapeutical treatment, and the thermal brines of Rehme and Nauheim in Germany, and Droitwich in England, are also useful. For the relief of the pain of ataxy, I can strongly recommend the salicylate of soda, in twenty grain doses several times a day. It often acts better than the hypodermic injection of morphia or chloral, but is likewise, as all other remedies, occasionally disappointing. Special attention must be given to the state of the bladder and rectum. For catarrh of the bladder with ammoniacal decomposition of the urine, the salicylate of soda in the doses just mentioned is useful; while for constipation, the Hunyádi János water and allied remedies may be given. Where symptoms of general debility and impaired nutrition are prominent, phosphorus and cod-liver oil, alone or in combination, have proved to me most valuable.

For lateral sclerosis, ergot and nitrate of silver likewise deserve a trial. For the relief of the muscular rigidity and twitches, the bromides of sodium, potassium, and ammonium may be given. I have sometimes usefully combined them with extractum physostigmatis, in doses from $\frac{1}{8}$ to $\frac{1}{2}$ grain, and succus conii. The motor debility is often successfully combated by galvanization of the cord and suffering nerves; and the use of sulphur baths at a temperature of 98° or even 100° may prove serviceable.

Article III.

The Muscle of Accommodation, and its Mode of Action.

By M. J. De Rosset, M.D., of New York, Ophthalmic Surgeon to Dispensary Holy Trinity, Assistant Surgeon New York Eye and Ear Infirmary, etc. etc.

The physiological rôle performed by the anatomical elements within the eye for the purpose of adapting vision to varying distances has never been satisfactorily explained; and the inherent difficulties which oppose an explanation have hitherto appeared so insuperable, that physiologists generally, and ophthalmologists, whom the matter more nearly concerns, have, in despair, been forced to a tacit assent to the Helmholtz theory as the least objectionable yet propounded.

The difficulties in solving this question issue not so much out of our ignorance of the anatomy of the structures involved (for this has been very perfectly demonstrated), as out of our failure to recognize that some of them cannot, for mechanical reasons, perform their rôle in the manner which the prevailing hypotheses demand. Whence this failure, it is impossible to say, unless it is from our having been fettered by the weight of authority and tradition; and it may seem almost madness to disturb the peaceful repose by engaging in a work that has for its purpose the overthrow of views upon which is founded so large a portion of what is held as sound in ophthalmic practice. Other difficulties encountered in the inquiry come from the uncertain state of our knowledge concerning the function and influence of the nerves which are known to be supplied to the ciliary muscle, and as long as we remain ignorant upon this important point, we should be very careful in inferences as to the bearing which physiological experiments on the nerves, and the disturbances caused by obscure pathological processes, have upon the question. Still another difficulty is in the notion, almost universally entertained, respecting the action of mydriatics and myotics. This notion, it is well known, has not been derived from actual observation, but is wholly assumed in a shape